BC
Ministry of
Forests

COMING OF AGE IN THE FLATHEAD

How the British Columbia Forest Service Contended with the Mountain Pine Beetle Infestation of Southeastern British Columbia 1976-1986

By Cameron Young

Prepared under the auspices of the
Forest Pest Review Committee
of British Columbia

Pest Management Report Number 10
May 1988
Province of British Columbia

Ministry of Forests

89-01336/

Canadian Cataloguing in Publication Data
Young, Cameron, 1944-
Coming of age in the Flathead

(Pest management report, ISBN 0710-7935 ; no. 10)
ISBN 0-7718-8682-9

1. Mountain pine beetle — Control — Goverment policy — British Columbia — Flathead River Valley. 2. Pine — Diseases and pests — Government policy — British Columbia — Flathead River Valley. I. Forest Pest Review Committee of British Columbia. II. British Columbia. Ministry of Forests. III. Title. IV. Series.

SB945.M78Y68 1988 634.9'751676 C88-092165-X

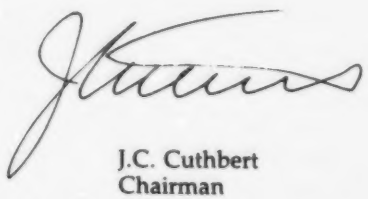
FOREST PEST REVIEW COMMITTEE of BRITISH COLUMBIA

The mountain pine beetle has been the most important forest insect pest in the Province of British Columbia for decades. One of the most significant of the outbreaks of this insect occurred in the southeast corner of the Province, in the Flathead River drainage, during the late 1970's and early 1980's.

This outbreak, more than any before, illustrated the destructive potential of forest insects and necessitated an integrated management approach be taken by the various management agencies and industries affected. Many lessons in forest pest management were learned; these lessons will be incorporated into future practices designed to enhance and maintain forest productivity.

Lessons are usually learned and remembered only if adequately documented. Therefore, I am pleased to introduce this publication which details the issues and management responses presented by the Flathead infestation.

In the future, good forest management incorporating preventive pest management practices and supported by cooperation with other forest resource users should control or lessen the impact of insect devastation. Experience should provide a firm foundation for the resolution of future resource-threatening issues.



J.C. Cuthbert
Chairman

July, 1988

TABLE OF CONTENTS

Introduction	7
Flathead: The Setting	8
The Mountain Pine Beetle	10
The Flight Of The Beetle: Mid-1970's	11
The Flathead Is Overrun: 1977-1981	12
The Akamina and Kishinena	15
International Implications	16
Frontline Perspective: Nelson Regional Manager R.R. Tozer	17
Operations: The Early Years (1977-1981)	18
Operations: The Later Years (1981-1985)	20
Master Plan	21
Frontline Perspective: Pest Management Officer S. Byford	22
Silviculture and Protection	23
Public Involvement	25
Frontline Perspective: Public Involvement Officer N. McLeod	26
Aftermath	27
Conclusions And Lessons Learned • Follow-Up • Eternal Vigilance • Be Prepared • Learn To Live With The Beetle • Staffing Up • The Human Element • Cost-Benefit-Risk Analysis? • Still To Be Learned • Summary	28
Epilogue	31

INTRODUCTION

"What was all the fuss about anyway?"

That's an observor's first reaction on touring the Flathead Valley today in search of pine forest devastation, the aftermath of a massive infestation of mountain pine beetle that began in 1976 and subsided in 1981.

The main industrial gravel road through the valley passes by expanses of semi-forested meadowlands punctuated by the graceful branches of isolated larch trees. The adjacent forests consist primarily of immature stands of lodgepole pine mixed with spruce and some Douglas-fir. Although one notices a considerable amount of gray snags, the dominant colour of the forest is green.

Spur roads disappear in all directions across the undulating landscape, but most roads are now purposefully blocked to vehicle traffic. These roads are tangible reminders of the intensive logging program that was rushed into action to cope with the unprecedented beetle attack.

The years during and immediately following the mountain pine beetle outbreak were turbulent ones for the British Columbia Forest Service. The events that transpired at that time and the lessons to be learned from that trail-breaking experience are the subject of this report.

"Extensive areas of forests killed by bark beetles pose significant problems to forest management"

FLATHEAD — THE SETTING

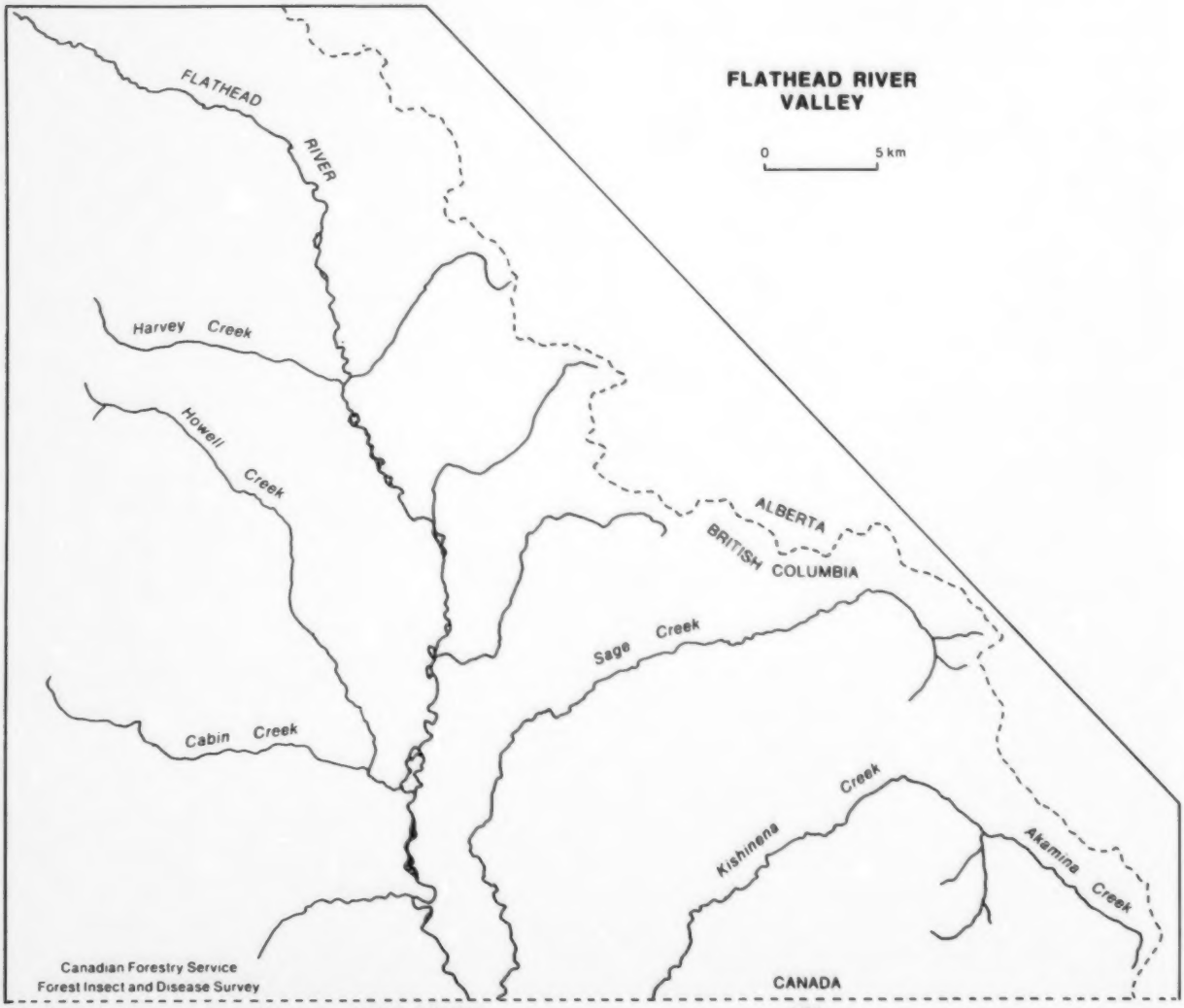
The Flathead Valley is a term used to identify a large system of drainages in the southeast corner of British Columbia that eventually join up and flow south into Flathead Lake in Montana. Two significant side drainages on the east side of the Flathead River are the Kishinena and Akamina creeks.

In 1976 the Flathead fell within the boundaries of the Fernie Public Sustained Yield Unit, which accounted for roughly two-thirds of the Fernie Ranger District. Crows Nest Forest Products headquartered in Elko was the only forest company operating in the area.

The Flathead Valley, which extends 50 kilometres northward from the U.S. border, is nestled in the foothills of the Rockies 1500 metres above sea level. The valley floor harbours a complex array of old river terraces and creek draws.

The region is home to Rocky Mountain sheep and goats, mule deer, whitetail deer, elk, moose, wolves and grizzly bear. The river system is filled with Dolly Varden and cut-throat trout. The Flathead is considered an exceptional area for hunting, and several guide outfitters hold licences in the region. It is also a popular wilderness recreational area for local hunters and anglers.

From a forest ecology perspective, the Flathead is



"The Flathead Valley lies in the southeast corner of British Columbia"

located in the Montane Spruce Biogeoclimatic Zone. Here the theoretical shade-tolerant climax tree species is white spruce or, more likely, a white spruce/Engelmann spruce hybrid. However, old, extensive forest fires in the Flathead have produced a forest cover well represented by the seral species, lodgepole pine. Western larch, Douglas-fir and whitebark pine also occur in the Flathead, along with trembling aspen.

As the forests climb the valley slopes, the Montane Spruce Zone gives way to the Engelmann Spruce/Subalpine Fir Zone. Even at these higher elevations lodgepole pine forests are common in locations where fire has left its mark. Overall, these upper regions are dominated by whitebark pine. At the tree line the hardy, miniature vegetation of the Alpine Tundra Zone begins to dominate the mountain landscape.

A similar landscape characterizes Alberta's Waterton Lakes National Park to the east and Montana's Glacier National Park to the south. The Akamina and Kishinena drainages border the two parks and share a common geographical setting.

When the Flathead River enters the United States it becomes known as the North Fork of the Flathead. On its west bank is Flathead National Forest; on the east is Glacier National Park. The North Fork of the Flathead is designated a wild and scenic river.

Despite its remote location, the Flathead Valley has not been a stranger to development. Mineral exploration is a regular occurrance in the valley, and seismic lines penetrate many wilderness areas. Oil and coal are the traditional objects of exploration, although underground reservoirs of carbon dioxide gas are of interest currently.

Maps of the region show a settlement called Flathead. Apparently this town site was surveyed in the 1920's in the expectation of an oil boom overtaking the valley. The boom never occurred and the town was never built. (This fact came as a great shock to an evangelical minister and his family from the eastern United States who drove into the town site one day in the late 1970's, intending to preach the gospel to the non-existent townspeople and survive on the generosity of their offerings.)

Spruce beetle infestations have been sporadic in the Flathead, with major infestations occurring in the mid-1950's and late 1960's. No mountain pine beetles were officially recorded in the Flathead by the Canadian Forestry Service (CFS) between 1923 and 1976, although the occasional isolated outbreak was noted by British Columbia Forest Service staff. These sporadic outbreaks collapsed due to a variety of biological and climatic factors.

Logging activity in the early 1970's focused mainly on the spruce stands associated with the bark beetle outbreak. The lodgepole pine, which was much less commercially valuable than it is today, generally was considered too small or immature to figure in any cutting regime.

Lightning strikes are not usually a major forest fire threat in the Flathead, but people often are. The logging and mining roads open up the entire area to a large number of hunters and other recreationists, anyone of whom could be careless with a match. Over the first four decades of the 20th century the Flathead experienced a number of severe forest fires, and the areas affected regenerated primarily in lodgepole pine. Since 1945, however the Flathead has not had what can be considered a serious fire.

Reflecting its fire history, the forest profile of the Flathead in the mid-1970's was one dominated by pine forests 40 to 60 years old. It also contained pockets of mature pine that had survived the earlier fires. This preponderance of pine stands laid the basis for the mountain pine beetle epidemic.

"The Flathead Valley is nestled in the foothills of the rockies and harbours a complex array of old river terraces and creek draws"

THE MOUNTAIN PINE BEETLE

First described by Hopkins in 1902 from specimens collected in the Black Hills of South Dakota, the mountain pine beetle can be found throughout pine forests from about 56 north latitude in British Columbia to Northern Mexico, and from the Pacific Ocean on the west to South Dakota on the east. It occurs from sea level in British Columbia to over 12,000 feet in Northern Mexico. Its main targets in B.C. are lodgepole pine, ponderosa pine, western white pine and whitebark pine.

Typically, the beetles emerge from under the bark of their host trees in July and August, swarming to new trees where they construct galleries in the phloem-cambial layer. Fungi, bacteria, and yeast spores carried into the tree by the beetle start growing in the living tissue of the sapwood and phloem. Within two weeks the fungi begin to form pigments, and the infected wood is stained blue. The fungi invade and kill cells, interrupt water conduction, and cause a rapid reduction in the moisture of the sapwood.

The trees attempt to repel the invaders by releasing large quantities of resin. The resin mixes with the wood dust left behind by the beetles boring into the tree and forms a soft white or reddish substence around each bore hole called a pitch tube. Normally, a tree will only survive a beetle attack if the infestation is not too severe and if the tree is young and vigorous. During massive infestations, a tree will experience six to eight attacks per square foot of trunk. This gives it little chance of survival.

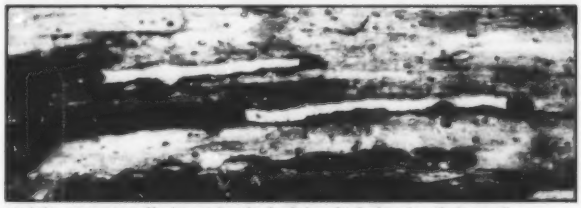
Even as the beetles construct their egg galleries in the tree's inner bark, they lay their eggs along the side of the galleries. Larvae hatch from the eggs and feed in the inner bark. Inactive during the winter, the larvae resume feeding in the spring and complete development by early summer. They complete their transformation from larvae to pupae to adults by July.

The emergence and flight of new adults begins after several days of relatively high temperatures. The beetles typically complete their flight to new host trees within a two-week period. Within a year following the initial beetle attack, a tree's foliage starts turning yellow and finally becomes red. Most of the needles drop from the tree after two years, leaving a dead gray snag.

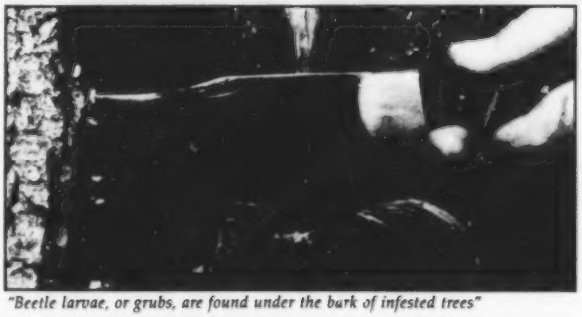
Low populations of mountain pine beetles maintain themselves by attacking individual or small groups of trees scattered throughout a stand. These local infestations often occur where trees are under stress. Examples include growing sites with widely fluctuating water tables, or sites that are dry and exposed. An outbreak can begin from these small groups of infested trees and spread progressively through a stand. As an outbreak picks up momentum it overcomes natural tree resistence to the beetle.

Because the mountain pine beetle survives much better in less resinous, older trees, infestations typically develop into outbreaks in stands over 80 years old that contain high numbers of trees with diameters larger than 25 centimetres. The beetles' first targets are the dominant and co-dominant trees. As the infestation expands, they work their way down to the smaller trees.

Outbreaks are likely to begin in stands at low elevations where warmer temperatures allow the beetle to complete its life cycle in one year. As the infestation moves up the mountain slopes, the beetle is less likely to complete its life cycle in one year, experiencing heavy mortality during the longer developmental period. A mountain pine beetle infestation will collapse once the supply of susceptible host trees is exhausted, often in combination with unfavourable weather conditions.



"Adults excavate galleries under the bark in which they lay their eggs"



"Beetle larvae, or grubs, are found under the bark of infested trees"

"Blue staining fungus, introduced by the burrowing beetles, blocks off water-conducting tissues in the tree"

THE FLIGHT OF THE BEETLE:
Mid-1970'S

The mountain pine beetle attack that struck the Flathead in the mid-1970's was the most sensational in a series of outbreaks that were occurring simultaneously in both Canada and the United States. The pine forests of Utah, Wyoming, Idaho, Oregon, Washington and Montana were all under attack, and large populations of beetles began appearing in different parts of British Columbia, especially in the Nelson Forest Region and in the Cariboo. Southwestern Alberta fared no better, with Waterton Lakes National Park in Alberta breaking out in a sea of red-tops. Most relevant to the Flathead was the fact that Glacier National Park was experiencing a significant mountain pine beetle outbreak right across the Canada-U.S. border. By 1975 this outbreak had reached massive proportions, and the U.S. Flathead National Forest immediately to the west of the park was facing an epidemic as well.

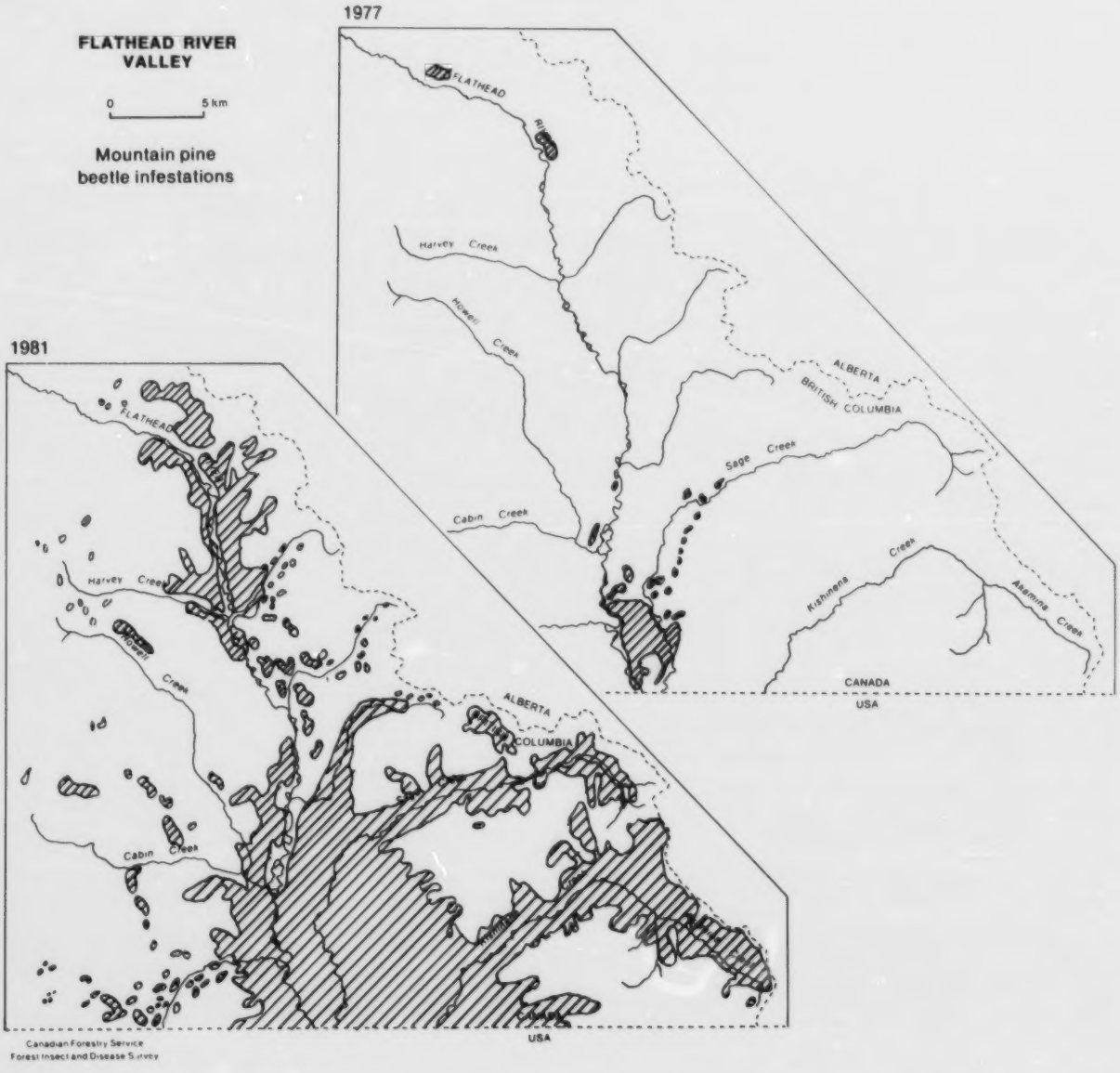
U.S. Forest Service officials with the Flathead National Forest believed the situation was exacerbated by the inaction of officials from Glacier National Park. They felt that if Park officials had undertaken early control measures, they might have slowed down the rapid spread of the beetle and allowed the U.S. Forest Service more time to counter the building infestation. As it was, the Flathead National Forest was overrun by the beetle, a situation made worse by the fact that there were few access roads in place to facilitate control logging operations. This infestation would prove to be the worst mountain pine beetle attack ever recorded in the United States.

"The Flathead outbreak killed pine trees over extensive areas"

THE FLATHEAD IS OVERRUN
1977-1981:

North of the border in B.C.'s Flathead Valley, the Deputy Ranger from the Forest Service Ranger Station in Fernie (which had jurisdiction over the Flathead) remembers spotting the tell-tale pitch tubes of the first beetle-attacked tree at Couldrey Creek in 1975. In early 1976, the Forest Service did an aerial survey of the area and noted widespread expansion of red and yellow tops, particularly adjacent to the U.S. border near the confluence of the Akamina/Kishinena and Flathead rivers. The Federal Insect and Disease section of CFS was notified, and surveys were greatly intensified.

In July of the following year a ground inspection of mature pine located between the Flathead River and

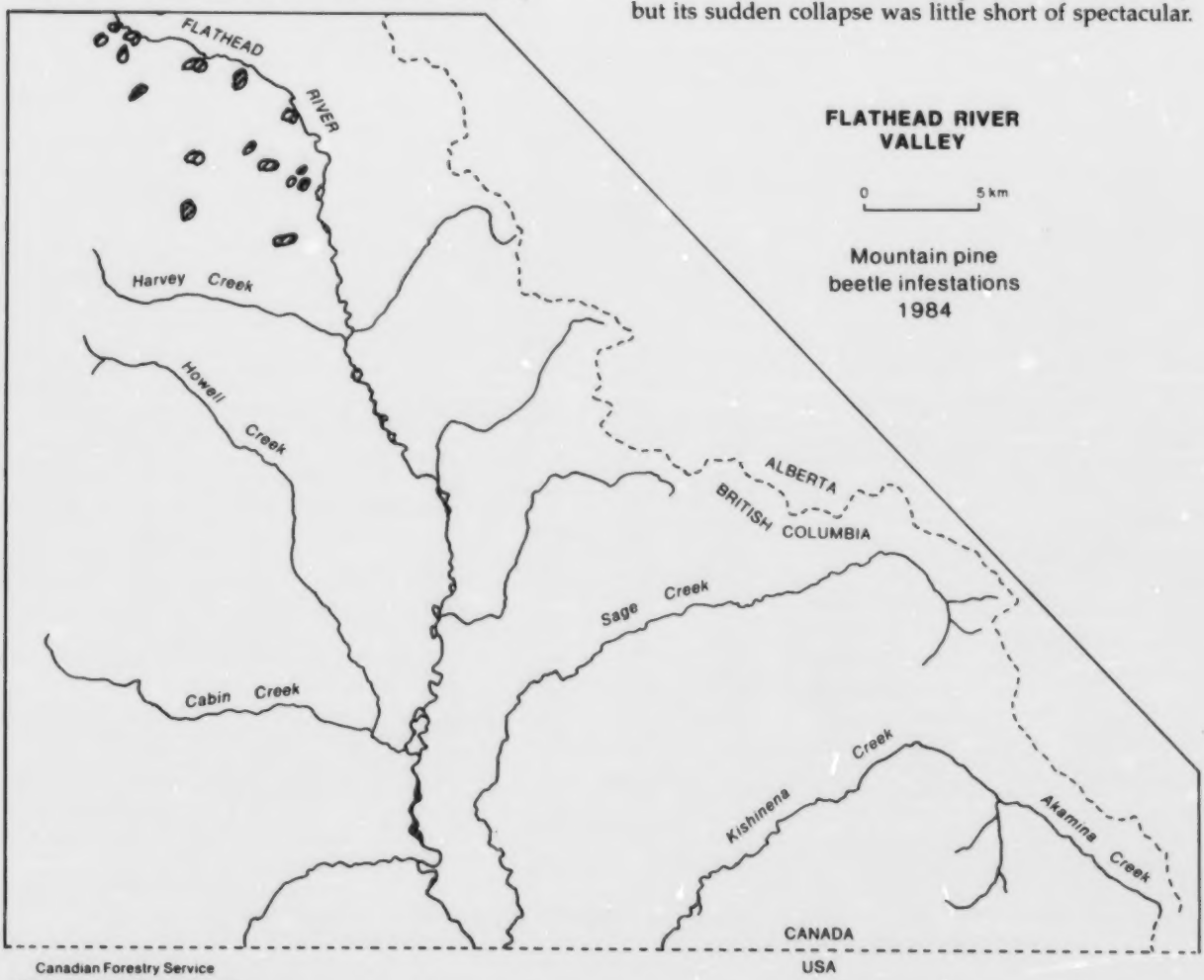


Sage Creek revealed, as summarized in a memo by Fernie Ranger Larry Humphrey, "That the pine bark beetle has been active the last few years, and has killed a significant volume of lodgepole pine. The attack this year is evident, but does not seem out of proportion to the previous years — perhaps even less. It appears, however, that if this attack continues for a few more years it will contribute heavily to the death of most, if not all, of the mature and decadent lodgepole pine in this area. It could also, if conditions are right, explode into a serious infestation of all the pine in the valley."

Since the needles of a beetle-killed pine turn red within a year, aerial surveys can readily spot the number of pines that have succumbed to the insect in the past year. These are referred to as red-topped pines. Statistics later revealled that the red-top count for 1977 in the Flathead had reached 4,500, and that the beetles already had infested another 100,000 trees which would show up in the red-top count of 1978. The mountain pine beetle infestation of the Flathead had now begun in earnest.

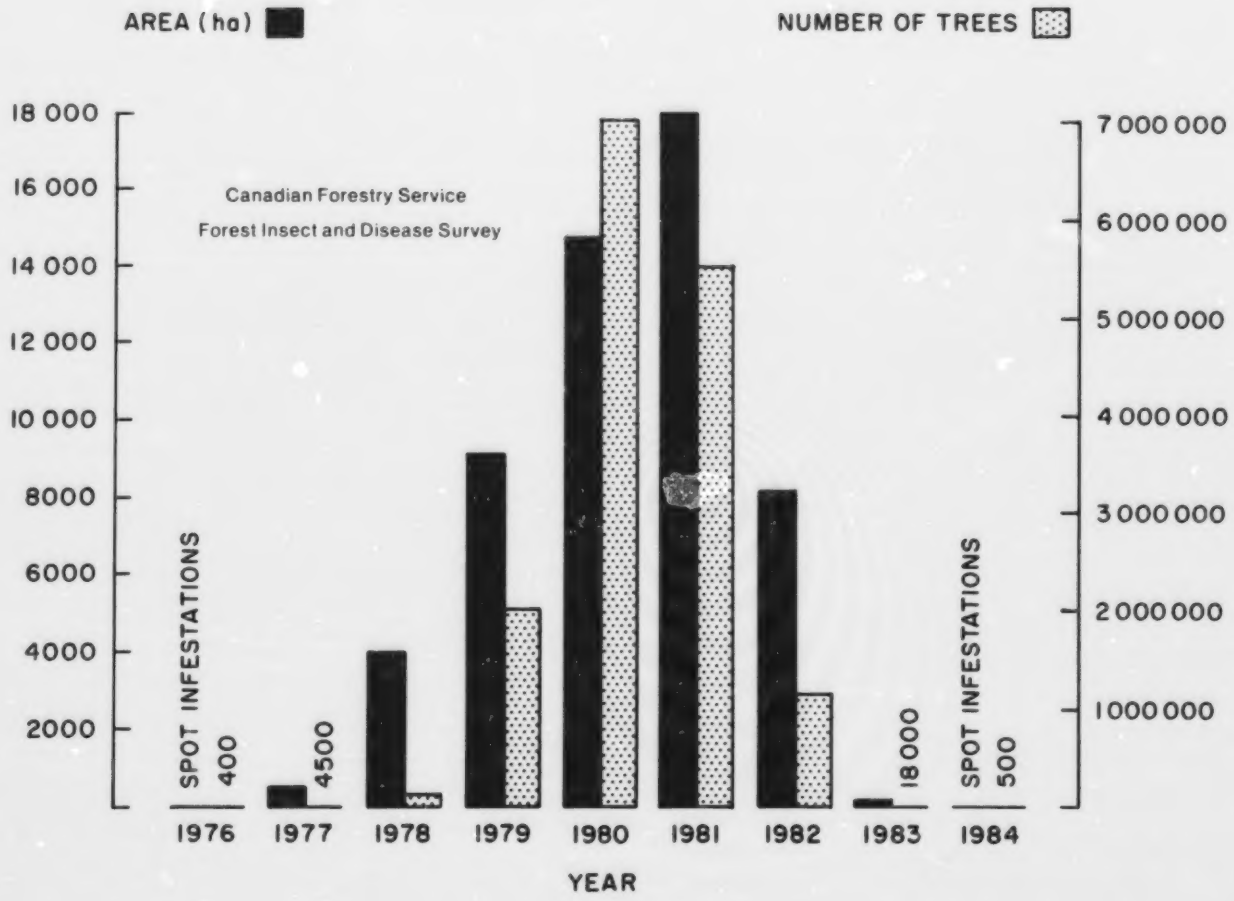
By 1979 the infestation in the Flathead had skyrocketed to two million red-tops, and then soared out of sight in 1980 when seven million red-tops covered the valley. During this period of mass invasion, the beetles attacked virtually every pine in their path, regardless of size or age. It was generally assumed that the infestation would sweep up the Flathead and continue up the Rocky Mountain Trench, but the Flathead infestation suddenly ground to a halt in 1981, much to everyone's relief.

Typically, when a mountain pine beetle infestation runs out of mature timber and the insect is forced to attack smaller diameter trees, these smaller host trees cannot provide the nourishment required to sustain large beetle populations. The infestation then subsides because of this "host depletion." For the Flathead, and indeed, for most mountain pine beetle infestations, host depletion alone is not a sufficient explanation for the sudden collapse of a massive beetle attack. Other factors are believed to work in combination with host depletion, including severe climate conditions and increased resistence by the trees to the beetles. No one is sure what the exact factors were in the Flathead that finally subdued the beetle, but its sudden collapse was little short of spectacular.



Canadian Forestry Service
Forest Insect and Disease Survey

MOUNTAIN PINE BEETLE
IN LODGEPOLE PINE
FLATHEAD RIVER VALLEY



Area and number of mature Lodgepole Pine killed by Mountain Pine Beetle in the Flathead River Valley, B.C., 1976-1984

THE AKAMINA AND KISHINENA

As the Forest Service would soon find out, coping with a massive beetle infestation involves more than dealing with forests and insects. Almost importantly, it involves dealing with the public who are in some way affected by the attack — or by the forest management measures instituted to counter the beetle attack. In the Flathead, public concern over the proposed salvage logging of the Akamina/Kishinena drainage would prove to have a significant influence on Forest Service land management policies and practices.

At issue was the fact that the Akamina/Kishinena was a park-like wilderness of high elevation valleys forested in Engelmann spruce, subalpine fir, lodgepole pine and whitebark pine. It bordered the International Peace Park (Waterton Lakes National Park in Alberta and Glacier National Park in Montana), and had been proposed as a park as far back as 1917. A Recreational Reserve was established there in 1956.

Considerable pine stands throughout the Akamina/Kishinena were affected by the mountain pine beetle infestation, and the Forest Service wanted to salvage as much of the timber as possible before the beetle-killed wood lost all economic value. By contrast, park supporters stressed the need to preserve the wilderness character of the Akamina/Kishinena by not logging the beetle-killed timber. This was the policy adopted by Waterton and Glacier National Parks, the point of view being that beetles are part of the natural world; an infestation should be left to run its course in park/wilderness areas. Salvage logging was considered destructive and abnormal, further opening the door to development.

Faced with rising public concerns in this sensitive area — even as the beetle was flooding into the entire Flathead Valley in massive numbers — the Forest Service undertook to prepare a wide-ranging Co-ordinated Land Use Plan for the entire Akamina/Kishinena that would try to accommodate the needs of all user groups.

The area was — and is — a key habitat for grizzly bear, wolf, mountain sheep, mountain goats, and various ungulates including moose and elk. Given that the area was to be logged, the provincial Fish and Wildlife Branch expressed concern that wildlife habitat be protected, while the Fernie Rod and Gun Club lobbied strongly against excessive logging that would destroy the wilderness-like character of the Flathead.

From the United States there was concern expressed over border wildlife populations that might be affected by logging, especially grizzly bear and timber wolf. The U.S. was also concerned that the Dolly Varden residing in Flathead Lake would be threatened if their spawning grounds, the Akamina/Kishinena, were disrupted by sediment entering the water system as a result of the logging.

For their part, Forest Service personnel stressed the urgency of trying to contain the spread of the beetle at its early stages, and to recover the economic value of the timber from the stands already affected. They pointed out that the beetle-killed forests contributed to the allowable annual cut for the area; not logging this timber would reduce the area's overall timber supply. Also, harvesting and reforesting the affected stands would greatly accelerate the rate of forest regeneration and benefit the area's long-run timber supply. If the infested trees were left to become a sea of standing grey snags, natural regeneration would be slow in coming and the resulting fire hazard would be of great concern.

Moreover, the proposals contained in the Co-ordinated Land Use Program clearly indicated that logging in the Akamina/Kishinena would be concentrated only in infested or susceptible pine stands, that extreme care would be taken not to damage the overall watershed, and that every possible effort would be made to ensure that the Akamina/Kishinena lost little of its recreational appeal. Fundamental to the plan was a strong commitment by the Forest Service to close down logging roads once their short-term use had expired.

Following extensive public involvement and a genuine effort by all concerned to mitigate the negative aspects of salvage operations, the plan was completed late in 1977 and forwarded to the B.C. Cabinet's Environment and Land Use Committee (ELUC) for full governmental approval. Subsequently, in April of 1978, ELUC was presented with a proposal from the provincial Parks Branch to declare much of the area a Recreation Area.

ELUC finally ruled that all B.C. lands adjacent to the International Peace Park would be designated Zone A and be subject to special planning guidelines before any logging could be carried out there. Zone A basically consisted of the Akamina drainage on the east, and the drainages of Starvation Creek and North Kintla Creek in the south. The Kishinena drainage was classified as Zone B and was to be managed according to the guidelines contained in the Co-ordinated Land Use Plan, and in close cooperation with the Fish and Wildlife Branch. ELUC also specified that a full recreation plan be developed for Zone B. In short, ELUC supported salvage logging of the infested pine stands of the Akamina/Kishinena, but insisted that it be done with great care and sensitivity.

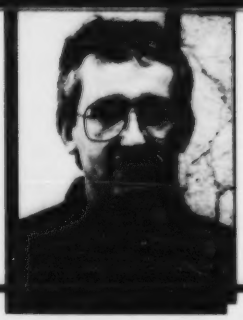
INTERNATIONAL IMPLICATIONS

Because of concerns that logging the Akamina/Kishinena would have disastrous effects on the wilderness of Glacier National Park, the United States government expressed formal concerns over the matter to the Canadian government. Officials came to B.C. from Ottawa to meet with U.S. federal representatives, and in time a number of cooperative arrangements were worked out. In 1981 the Canadian Forestry Service hosted an international Mountain Pine Beetle Review, and as part of a broader memorandum of understanding covering a variety of forestry issues, in 1982 the Canadian and U.S. governments developed a memorandum of understanding on developing and exchanging information on mountain pine beetle management. (This agreement was renewed in 1987 and includes a series of action plans to deal with ongoing beetle management concerns.)

At one stage the special Canada - U.S. International Joint Commission became involved because of the perceived threat to the water quality of the North Flathead. This led to regular water quality sampling tests on the Akamina/Kishinena by Canadian federal officials. Also, local agreements were reached on conducting a border grizzly bear study and a border wolf study, and forest protection and resource management officials from both sides of the border still meet on a regular basis.

FRONTLINE PERSPECTIVE:
Looking Back At It All

R. R. TOZER
Nelson Regional Manager



In the initial years of the mountain pine beetle outbreak in the Flathead, we were naive and optimistic in our understanding of its dynamics. When it became evident that we were facing an epidemic, we defined the scope of the problem through beetle surveys, visual observations and some ground work. We co-ordinated our efforts with the forest industry and with the Fish and Wildlife Branch, and established a road infrastructure in what was essentially an unroaded valley. Our philosophy was to to control the outbreak, salvage as much wood as possible, and finally arrest the outbreak. After a few initial fumblings and problems, the plan unfolded quite well.

It became obvious early on that the standard method of issuing cutting authorizations was too time-consuming if we were to control the outbreak. So a co-operative working partnership was developed among field staff from the Forest Service, the Fish and Wildlife Branch and the forest industry. Decisions that incorporated fish and wildlife and other environmental needs were made right at field level at the same time as roads were being located and cutblocks were being selected.

To ensure that logging was concentrated in pure pine stands, general field guidelines were established whereby the highest quality pine was logged first. If a mixed stand contained over 30 percent spruce, it would be left behind in favour of stands of pure pine. The success of the Flathead operation at this stage was due entirely to the field staff from the three organizations who, not always seeing eye-to-eye, always managed to come up with workable solutions.

When the beetle population began growing exponentially we prayed for cold winters. Below a certain temperature beetles begin to die off. We do get cold winters in the Flathead, and there were some incidences of winter beetle kill in the early years of the outbreak. But someone — I forget who it was — put it into perspective for me. He said that rather than thinking in percentages, such as a cold winter might kill off 90 percent of the beetle population, we should put it into numbers. If we have 10 million beetles in the Flathead, he said, and a cold winter kills 90 percent of them, we still have a million beetles left with more than an adequate food source to sustain them.

As the efforts to control the beetle continued, we strengthened our knowledge of the dynamics of beetle epidemics. I can't say our thinking changed overnight, but we did begin to develop a more realistic approach to what is virtually a permanent condition. Historically the beetle has been here, and it will be here again after we are gone.

We realized that we had large numbers of stands of susceptible pine located in other parts of the Cranbrook Forest District and in the Invermere and Golden Districts. We developed a program that would quickly identify beetle outbreaks and locate highly susceptible stands. That put us in a position to get the roads in place ahead of the beetle, to log out any hot spots, and salvage the main core areas.

While many mistakes were made in the Flathead, many positive elements developed out of the experience. The East Kootenay Insect and Disease Control Committee is a co-ordinated body with representatives from the Forest Service, the Fish and Wildlife Branch and the forest industry. It has specific working groups that plan strategies and address the overall mountain pine beetle issue. Co-ordinated access management planning developed to deal with the many roads we put into the Flathead. The Forest Service developed a core of pest management specialists, and everyone realized the importance of involving the public in specific plans.

OPERATIONS:
The Early Years (1977-1981)

Faced with the mountain pine beetle crisis in the Flathead and the need to log the affected timber before it deteriorated, in 1977 the Forest Service had to completely revamp logging priorities for the overall area. The company holding the timber rights in the Flathead, Crows Nest Forest Products (CNFP), was to shift its operations away from the Cranbrook PSYU to concentrate on the Flathead section of the Fernie PSYU. Because of the urgency of the situation, it was decided that no specific cutting areas would be marked out in advance of logging. All harvesting and related land management decisions would be determined on a site specific basis by CNFP supervisors and a Forest Service representative.

Salvage rates were not in effect at this time, although the company received various concessions to encourage it to begin operations immediately. Out of concern for the long-term forest productivity of the Flathead, all logging activity was to be focused on stands of mature pine. Spruce would only be logged where it formed a small component of a pine stand.

Following a delay on salvage logging throughout the Flathead while the Akamina/Kishinena question was being dealt with, a large cutting permit was issued in the Flathead Valley in the fall of 1977. By the end of that year, some logging had occurred as far south as the western end of the Kishinena. Unlike previous years, when logging in the Flathead shut down at year's end and didn't re-open until the following July, the roads were kept open throughout the winter. From then on salvage logging became a year-round operation.

Responding to the ELUC directive that logging in the Akamina/Kishinena be carried out with due care and attention to other forest values, the Forest Service assigned a Deputy Ranger and up to four assistants to work exclusively on the salvage program for the entire Flathead valley. They concentrated mainly on laying out the cutblocks, and the impact of logging on fish and wildlife habitat was a major concern. Considerable effort went into such measures as establishing game corridors, preserving critical winter habitats, and leaving streamside reserves.

The Deputy Ranger worked in close association with the logging foreman from Crows Nest Forest Products, and with the habitat protection officer from the Fish and Wildlife Branch. This association, born out of anxiety over the beetle attack and hurriedly put into place, eventually proved to be one of the more positive outcomes of the entire Flathead experience. The three parties worked in close cooperation to ensure that salvage logging throughout the Flathead — not just in the drainages of the Akamina and Kishinena — clearly accommodated the needs of fish, wildlife, recreation and aesthetics.

Time was of the essence, and virtually all planning was done on the run with the logging equipment idling in the background. Typically, Forest Service and company personnel would walk through a proposed cut block, keeping an eye out for game corridors, watering holes and various other key game habitats. They would then decide on the spot how to best design the cut block to preserve these important features.

The general policy was to log stands that contained no less than 30 percent pine. Selective logging practices were used to ensure that windfirm species other than pine were left as seed trees. Areas of non-merchantable pine were left as distinct islands to improve wildlife habitat and to act as a buffer between areas of logging. Pure spruce stands were to be left standing to sustain future timber supplies. Overall, as much beetle-killed wood as possible was to be salvaged before it deteriorated beyond the point of being commercially viable.

However, Crows Nest Forest Products felt this position was too firm. They argued that once they were set up in an area, it only made sense to log more spruce along with the pine. Moreover, on several occasions they had to return to logged-off cut blocks to salvage isolated spruce seed trees that had blown over. Crows Nest also maintained that the smaller pine on its own did not bring them an adequate financial return.

Initially the company paid regular stumpage rates for the timber logged. It was only when the timber had been standing dead for a year or longer did salvage rates begin to be applied.

To handle the smaller diameter pine in the Flathead, Crows Nest brought in two feller-bunchers, several grapple skidders and a Hahn Harvester (a machine that delimbs trees right on site.) At its Elko mill, the head rig that normally handled the larger diameter spruce was shut down, and a Chip-N-Saw mill was installed to turn the smaller pine into dimension lumber.

At first the company was required to process all pine trees down to a four-inch top. The company argued that a four-inch top did not provide enough allowance to enable the saw to produce two, two-by-four boards from one cut. They requested that they be allowed to log trees with a five-inch top so they could improve productivity at the mill. The Forest Service compromised with a 4.5-inch top.

The years between 1977 and 1980 were a hive of activity in the Flathead as the mountain pine beetle swarmed up the valley. The entire area appeared to be covered in red-top pines. Forest Service personnel were stretched to the limit checking a myriad of operations including road layout, the size and location of cutblocks, the volumes of spruce removed, and the number of seed trees left in a cut block.

The sense of urgency under which people were operating has been compared to that of fighting forest fires. The accelerated logging schedule put a great demand on the time available to field staff to properly instruct and monitor operators at ground level. It was inevitable that some things wouldn't go according to plan, and there were the occasional difficulties with sub-standard roads, hillside scarring and erosion, streamside damage, and improper bridge construction. On balance, problems of this nature were kept to a minimum due to the vigilence of Forest Service field staff and forest industry personnel. Today there is little indication that either the forest land or the Flathead river suffered any long-term environmental damage.

From the Forest Service perspective, because Crows Nest virtually had exclusive access to the timber in the Flathead, the company also had an obligation to throw all its resources into the salvage program. However, the company was unable to meet all its logging commitments and its rate of cut in the Flathead fluctuated from year to year. In 1978, Crows Nest logged 190,968 cubic metres of timber. In 1979 the figure declined to 164,000, peaked at 217,871 in 1980, then dropped to 109,821 in 1981. This inconsistency greatly frustrated overall planning efforts to deal with the mountain pine beetle.

For its part, Crows Nest felt that it was too small a company to do all that was expected of it in the Flathead, arguing that it wasn't receiving adequate returns on what it considered to be marginal timber. It also felt that it was being hampered by too many constraints, that the salvage operation should have proceeded much more quickly and on a much larger scale.

In the final analysis, however, Crows Nest had a much bigger problem to deal with than the Flathead. By 1981 the bottom had fallen out of the lumber market for much of the B.C. forest industry. Even at salvage rates, the company couldn't continue operating in the Flathead because of high overhead costs and deteriorating timber quality.

Shortly after it pulled out of the Flathead in March of 1981, Crows Nest was sold to Crestbrook Forest Industries, the major forest company in southeastern British Columbia. This latter company was asked to take over salvage operations in the Flathead, and Crestbrook did an intensive review of the economics of the situation. It finally concluded that, due to the downturn in the market, salvage logging in the Flathead was not economically feasible. Besides, the beetle population was expanding elsewhere in the Cranbrook Timber Supply Area, and Crestbrook was involved in salvage operations in these areas.

"As much beetle-killed wood as possible was to be salvaged"

OPERATIONS:
The Later Years (1981-1985)

The Forest Service felt it was essential to log as many of the beetle-killed pine stands as possible so the land could begin growing a new crop of trees. The only other way to put the land back into production would have been to bulldoze the standing dead trees, then stack and burn them. To avoid this costly procedure, the Forest Service was determined to find logging operators willing to handle the beetle-killed timber — although most of the wood had been dead for at least two years and, possibly, had lost much of its commercial value.

When Crestbrook was unable to continue with the salvage logging program abandoned by Crows Nest, the Forest Service decided to offer the beetle-killed timber to local logging contractors at a public auction. However, local operators showed little interest in the timber so the Forest Service decided to offer the timber for export sales south of the border. To do this it had to receive approval from the Provincial Cabinet, through an Order-in-Council, to suspend British Columbia's raw log export regulations.

Normally no timber can be shipped out of B.C. until it is milled into lumber. Unprocessed raw logs can only be exported if they are shown to be surplus to the needs of the province's forest companies. The timber from the Flathead — which had proved to be of little interest to local operators — therefore was exempted temporarily from these export regulations.

By late 1982, Timber Sale Licences covering 500,000 cubic metres of exportable timber had been issued to five logging contractors. The major operator was a Montana-based consortium which also bought a considerable volume of logs from the other operators. The contractors employed a number of workers from the Fernie-Elko area, providing the struggling local economy with a much-needed boost.

Because of the low commercial value of the beetle-killed timber, the Forest Service provided the contractors with a number of incentives to help keep the salvage operation alive. Stumpage rates dropped to 25 percent of three percent of minimum stumpage, and the companies were allowed to log more valuable spruce and subalpine fir along with the low quality pine. The Forest Service also plowed the roads for the companies in winter and relaxed expensive scaling procedures. In return, the companies had an obligation to rehabilitate their logging sites once their work was complete, and they posted modest performance bonds to that effect.

At this point it should be re-emphasized that the economic recession of the early 1980's greatly influenced events in the Flathead. Here, as was the case throughout the Province, forest managers were instructed to relax utilization standards to help the forest industry survive the tough economic times.

With the winding down of operations by the major forest licencees in the Flathead, Forest Service field staff responsible for monitoring logging in the valley was reduced to a single individual. When the holders of the new timber sale licences began operations, this one individual became responsible for monitoring a number of logging contractors, all of whom had little technical expertise in forestry. Under these demanding conditions he did what he could to assist the contractors with such fundamental undertakings as developing logging plans, laying out roads, and determining the economic limits of salvage logging.

Logging in the Flathead continued through to June of 1985, with the trucks running logs into Montana year round. A significant portion of this logging took place in the upper reaches of the Akamina drainage. Approximately 135,000 cubic metres of wood were officially scaled over this period, but because of initial difficulties with scaling procedures, some of the early timber leaving the valley may not have been fully accounted for. Roughly 55 percent of all the timber logged between 1981 and 1985 in the Flathead consisted of species other than pine.

As the various logging contractors began pulling out of the Flathead, they generally failed to comply with their obligations to rehabilitate their logging sites. They chose to suffer minor financial penalties rather than incur large clean-up costs. Consequently, the Forest Service was left with a major site rehabilitation effort it hadn't counted on — especially in the Akamina/Kishinena. This was a rather unfortunate finale to an otherwise reasonably productive salvage logging operation.

Final statistics for the Flathead revealed that the mountain pine beetle attacked 20,600 hectares of pine forests. Significantly, only half of this attack occurred in mature pine stands, and today the Forest Service estimates that virtually all economically viable stands of attacked mature pine were salvaged. The considerable volume of dead snags left standing in the Flathead were not economic to log, or else were left standing to protect watersheds or to serve as wildlife corridors. On balance, there is no doubt that in terms of preparing the way for rapid forest regeneration and reducing the potential fire hazard, the Forest Service derived substantial benefit from the salvage logging program in the Flathead.

MASTER PLAN

Although the Flathead was the area hit hardest by the mountain pine beetle, all of southeastern B.C. felt the impact of the insect in a substantial way. By the late 1970's, forest managers realized that the problem would have to be addressed at a regional level. This lead to the revitalization of the East Kootenay Insect and Disease Control Committee, which was made up of key government and industry forest managers. Their main objective was to streamline regional administrative procedures so companies could begin harvesting beetle-attacked timber as quickly as possible. This included expediting the cutting permit approval process and facilitating the transfer of cuts between Timber Supply Areas to meet regional salvage logging goals.

A major accomplishment of this committee was the creation in 1980 of a five-year master salvage plan for the Cranbrook Timber Supply Area. This plan is still reviewed quarterly and updated annually. Today forest licencees have a commitment to log 70 percent of their cut in "priority" stands that are susceptible to bark beetles. These include over mature spruce stands susceptible to the spruce beetle.

Among many other accomplishments, the East Kootenay Insect and Disease Control Committee prepared a master fire protection plan for the Flathead, and by 1981 the committee had become an active lobby for the rehabilitation of the valley's beetle-killed forests.

"Forest managers realized that the problem would have to be addressed at a regional level"

FRONTLINE PERSPECTIVE:
Pest Management Today

S. BYFORD
Pest Management Officer

The Cranbrook Forest District pest management program consists of four full-time forest technicians working under the direction of the resource officer for protection. This group includes a designated "Pest Management Officer" who is responsible for daily budget administrations and the preparation of program goals, objectives and scheduling. The three other technicians work independently or in groups to collect and compile the site-specific information necessary for setting treatment priorities and making treatment recommendations.

The core of the bark beetle control program is an aerial detection survey. A fixed-wing overview survey is conducted in co-operation with the Forest Service regional staff and the Canadian Forestry Service. This is followed by a detailed helicopter survey. Field probes are then conducted to ground-proof the aerial survey results. The field probe summaries provide the basis for establishing timber harvesting priorities to control the bark beetle.

These control harvesting priorities are established by a joint committee composed of Forest Service staff, industry planners and Ministry of Environment personnel. This group operates as a sub-committee of the Cranbrook TSA steering committee and as a subgroup of the Kootenay Insect and Disease Control Committee. This latter committee has been in existence since the early 1970's to coordinate bark beetle control activities on a regional level. With its representation from government ministries, industry and other interest groups, it acts as a unified lobby for special funding and for changes in provincial policy to enhance bark beetle control. Recently this group expanded its scope to address pest management concerns other than bark beetles.

As active participants in the control harvesting program, the major forest licencees sign annual agreements with the Ministry of Forests to harvest 70 percent of their annual cut in stands earmarked by the joint committee for bark beetle control. These commitments provide a good yardstick for determining whether the annual control harvesting goals are met.

In the years following the collapse of the Flathead infestation, the mountain pine beetle has continued to be the most significant threat to mature timber in the Cranbrook Forest District. Almost half of this timber is overmature lodgepole pine. These stands have been rated according to their susceptibility to mountain pine beetle attack, and roads are being constructed into susceptible stands on an ongoing basis to facilitate beetle control activities. Perhaps a greater challenge lies ahead as huge areas of pine forests 60-80 years old reach maturity and become more susceptible to the beetle.

SILVICULTURE AND PROTECTION

The main goal of the salvage logging operation in the Flathead was to remove the standing dead timber so the land could begin growing a new crop of trees as quickly as possible. However, if left to regenerate entirely on its own, virtually the entire Flathead would have reforested itself in homogeneous pine forests — prime targets for future mountain pine beetle attacks. Therefore the original silvicultural goal for the Flathead was to promote the growth of species other than pine in order to establish a good mixed crop of trees.

Initially, a seed tree program was instituted whereby western larch and Douglas-fir trees were left standing in the clearcuts to provide a seed source for the new mixed species forest. Some of these sites were scarified, a process whereby mineral soil is exposed by the action of heavy machinery to promote seed germination. As well, orders for western larch and Douglas-fir seedlings were immediately placed with Forest Service nurseries. Several years later these seedlings were planted in some of the logged areas. By 1981 approximately 650 hectares had been planted, and more than double that amount had been scarified.

By the early 1980's however, the main silvicultural concern no longer was the reforestation of logged areas. The focus now had shifted to the rehabilitation of the beetle-killed forests containing small diameter trees that were uneconomic and impractical to log. Not only was this land unproductive, as over 70 percent of the trees had been killed by the beetle, but the standing dead trees were considered to be a serious fire hazard.

Beetle-killed pine trees retain some of their reddish

"A marden cutter was used to prepare the seedbed for natural regeneration"

brown needles for up to several years after their death. These dry needles and companion twigs and branches can easily ignite and start a major forest fire. Once the needles drop from the trees and begin to decompose, the fire danger is reduced.

The early 1980's were the critical years for fire prevention, as millions of dead pine still held onto their lifeless needles. To guard against the outbreak of a major forest fire, the Forest Service constructed three sets of fire breaks and stationed an initial attack fire crew in the area. The concern over an impending fire was so strong that reference was often made to the "Flathead Fire" as if such a disaster were a foregone conclusion. Fortunately, by the mid-1980s no serious fire had occurred.

Looking ahead, in the late 1980's the standing dead trees will begin to topple. The dead wood accumulating on the ground will increase the fire hazard once again, and once again initial fire attack crews may have to be stationed in the area to quickly extinguish any fire before it has a chance to develop. Overall, the risk of a major fire in the Flathead is higher now than before the beetle attack, and it will persist until most of the windfall has rotted away.

Perhaps of even greater concern are the great grey snag forests of Glacier National Park that were never logged or later rehabilitated. They too will begin to topple, and there are no natural or man-made firebreaks that would stop a fire from jumping the Canada-U.S. border into the Flathead Valley.

Silviculture activity in the Flathead proceeded at a modest pace through to 1985. Despite various proposals for provincially funded multi-million-dollar rehabilitation programs, silviculture activities in the valley remained the sole responsibility of the Cranbrook District. In the Akamina/Kishinena, considerable effort went into rehabilitating the logging sites and recovering some of the spruce logs abandoned by the major logging contractor.

One silvicultural program in the Flathead in the early 1980's involved the use of the Marden Cutter. This 12-ton device, pulled by a D-9 Cat, flattens and crushes small diameter standing dead timber and breaks up the layer of duff covering the mineral soil. Gently sloping valley expanses were treated with the Marden Cutter, and the resulting scarification provided the seedbed for the natural regeneration of pine and larch. Today these areas often form vast meadowlands where tall grass sometimes competes with the young seedlings for the available light and nutrients.

In 1986, as part of the federal-provincial Forest Resources Development Agreement (FRDA) to rehabilitate forests lands classified as Not Satisfactorily Restocked (NSR), 445 hectares in the Flathead were planted with pine seedlings, along with some spruce, larch and fir.

The 1987 FRDA program called for the planting of 750,000 seedlings on 575 hectares in the Flathead. This included 287 grassy hectares treated by the Marden Cutter and 106 hectares in the Akamina/Kishinena. Approximately 62 percent of the seedlings to be planted were lodgepole pine; the remainder were spruce, larch and Douglas-fir. Forest rehabilitation programs of this magnitude are expected to continue in the Flathead, drainage by drainage, through to 1990. However, to reduce the likelyhood of a mountain pine beetle epidemic ever occurring again, the plan is to log all future pine forests within 80 years — before they reach an age that makes them susceptible to beetle attack.

PUBLIC INVOLVEMENT

As noted earlier, the Forest Service could not combat the mountain pine beetle in the Flathead in isolation from local, national and international attention. Certainly, when the Akamina/Kishinena Coordinated Land Use plan was first developed in 1977, public input into the plan was received from a wide variety of agencies and the general public. Later, more detailed planning for the salvage logging of the Akamina/Kishinena attracted considerable public interest.

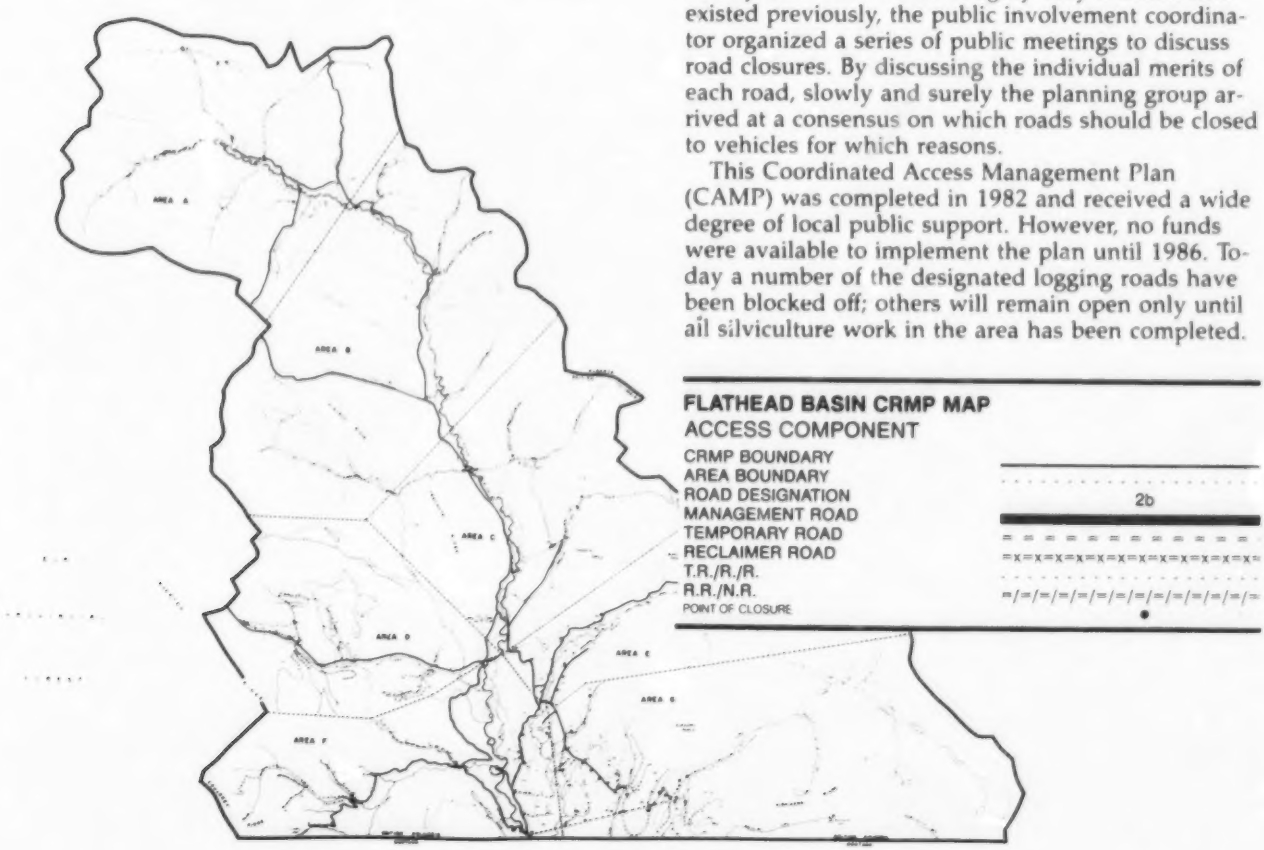
By 1980 the impact of the mountain pine beetle on the environment was of such widespread concern to the people of southeastern B.C. that the Forest Service appointed a special public involvement coordinator to deal with their concerns. Working out of the Cranbrook District office, the public involvement coordinator's role was to keep local officials informed about the beetle infestation throughout the East Kootenay, and to coordinate various public information events.

The coordinator also played a major role in obtaining public support for the overall Akamina/Kishinena plan. This was a critical undertaking, as all logging plans for the Akamina drainage had to be approved by the Environment and Land Use Committee of Cabinet (ELUC) before any work could be undertaken. ELUC had to be assured that the salvage plan had broad support before it would give that approval.

Another high profile public involvement issue was road access. From the very beginning of the beetle infestation, the conservation-minded hunting lobby had opposed the rapid development of the logging road network in the Flathead. They realized that increased road access would attract more vehicles and hunters, seriously disturbing the habitat requirements of many wildlife species and increasing hunting pressure on regulated game animals. To provide more security for the wildlife, the conservation organizations advocated a policy of restricted road access. To get into the back country, hunters would have to drive less and walk more.

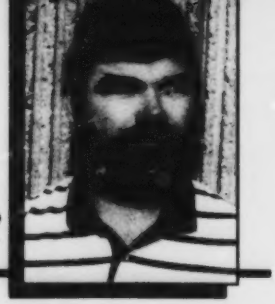
Given that the Flathead now contained approximately 250 roads where roughly only a dozen had existed previously, the public involvement coordinator organized a series of public meetings to discuss road closures. By discussing the individual merits of each road, slowly and surely the planning group arrived at a consensus on which roads should be closed to vehicles for which reasons.

This Coordinated Access Management Plan (CAMP) was completed in 1982 and received a wide degree of local public support. However, no funds were available to implement the plan until 1986. Today a number of the designated logging roads have been blocked off; others will remain open only until all silviculture work in the area has been completed.



FRONTLINE PERSPECTIVE:
Working With The Public

N. McLEOD
Public Involvement Officer



The role of public consultation in renewable resource management had been established in the East Kootenay long before the mountain pine beetle epidemic of the late 1970's. In fact, co-ordinated resource management plans had been in place for several years, a process designed to incorporate public preferences in technical decisions. However, Cranbrook District's major challenges had little to do with procedure. The scale of events was of much greater concern.

Few resource managers or users had anticipated the long ranging effects of a mountain pine beetle infestation. The list of impacts was substantial and included: accelerated harvesting in community watersheds; harvesting in visually sensitive recreation areas; large increases in road access; and high fire hazards adjacent to communities. In the public arena, the major impacts of the beetle infestation were overshadowed by the salvage measures planned to address it.

Recognizing a growing need for easily understandable public information, the Cranbrook District established a public involvement office staffed with two Forest Service technicians. The officers spent 18 months fielding inquiries from other provincial agencies, local governments and the general public. As well, they organized a variety of public education sessions dealing with such topics as the biology of the beetle and the forest management options available to deal with the epidemic.

These public forums took the form of field tours, workshops, guest lecturers, radio hotline shows and several feature newspaper articles. One such session involved bussing 60 people into the Flathead for a full day of interpretive demonstrations and group discussions on all aspects of the infestation. Invitations were extended to local Members of the Legislative Assembly, community mayors, regional districts, organized clubs and local media. The logistics and costs of this kind of undertaking initially may seem prohibitive, but the long-term benefits can be substantial.

The management of forest road access in the Flathead quickly emerged as the single largest public concern. Harvesting thousands of hectares of mature pine required a sizeable increase in road development and maintenance. Previously the Flathead had been viewed by many residents as an unroaded, *de facto* wilderness and the source of many outdoor activities. While users generally agreed that some action should be taken to recover the beetle-killed timber, they were not willing to see an increased level of industrial activity occur at the expense of their own pursuits. Co-ordinated Access Management Plans (CAMP) developed as a direct result of these concerns.

To a great extent, road access dictates the location, type and amount of forest use. The character of a previously undeveloped forest can be altered markedly or retained, depending on whether logging roads ultimately are maintained, closed down, or made subject to specific access restrictions. The introduction of Co-ordinated Access Management Plans to the Flathead, employing as they did a wide range of road management options, allowed for large scale salvage harvesting while returning designated tracts of land to their previous state.

In the final analysis the mountain pine beetle did not recognize any administrative boundary, whether that boundary separated two forest districts or defined the mandates of various government agencies. Consequently the Cranbrook office had to serve a dual role — on the one hand it advocated a timber salvage strategy; on the other it functioned as a source of advice for all affected parties.

AFTERMATH

From the entire Flathead experience, what stands out most clearly are the accomplishments of the highly motivated government and industry personnel who, in the early, high profile years, worked in close cooperation to set a high standard for salvage logging and environmental protection. By setting their collective sights higher than they could actually reach, they ensured that the Flathead would retain its productive capacity, and they prevented the valley from becoming a massive fire hazard.

Today the valley gives every indication that it is well on its way to growing a new and viable forest. The wildlife populations have not only survived, but they probably had their habitat improved; the Dolly Varden are still plentiful in the streams.

Demonstrating a strong sense of obligation to fulfil their managerial commitments, the Cranbrook Forest District has dedicated considerable funds and resources to rehabilitating and reforesting many of the logging sites in the Flathead. Also, untreated areas are greening up on their own, either because the surviving stems are flourishing, or through natural regeneration.

Public concern over access in the Flathead was dealt with squarely, and much of the carefully developed road access plan has gone into effect.

While the Flathead does not qualify as a true wilderness, aesthetically the valley is a pleasing area that offers recreational opportunities to hunters, fishermen, campers, and hikers accessing the higher mountain trails. The guide outfitters in the area are still in business.

And finally, a decade after it had first surfaced as the principal contentious issue in the Flathead, the Akamina drainage, along with part of the Kishinena, recently was declared a Recreation Area within the Ministry of Environment and Parks. This designation later may be upgraded to park status, but for the time being petroleum exploration is permitted to continue in the area.

"Today the valley gives every indication that it is well on it's way to growing a new forest"

CONCLUSIONS & LESSONS LEARNED

The sudden and dramatic infestation of the Flathead triggered a similarly intense response from resource managers in the field, and coping with the beetle was likened to firefighting. This was a new experience for many of the practitioners, and the infestation was of record proportions. Most of all, there was an extreme sense of urgency driving government and industry to keep the infestation down to a manageable size and to salvage as much useable wood as possible.

Because of all the attention brought to bear on the Akamina/Kishinena, the Forest Service, in addition to planning for the prompt and effective regeneration of beetle-killed forests, had the responsibility of ensuring that the salvage logging operations did not damage wildlife habitat or have an adverse impact on the Flathead River system itself. Working in close cooperation with the forest industry and the Fish and Wildlife Branch, Forest Service personnel were pressed into making scores of long-term land-use decisions on a daily basis. It is a tribute to their professional skill and dedication that a decade later the forest land base of the Flathead is in such good condition. However, following even the most successful of operations there are practical lessons to be learned and new management procedures to be implemented — or at least considered.

Follow-up

Salvage logging often involves an accelerated timber harvest undertaken under abnormal circumstances. To ensure proper execution of its logging and site rehabilitation plans, the Forest Service must maintain a comprehensive and disciplined monitoring program. In the Flathead, once the salvage program was well established, monitoring of the operations was given a reduced priority. In the later years, when the major licence holder withdrew from the valley and was replaced by half a dozen inexperienced contractors, there was insufficient field staff to monitor their operations.

While it is true that staff shortages are a chronic problem with all B.C. resource agencies, nonetheless all the land-use planning in the world means nothing if Forest Service officials can't adequately monitor the performance of logging operators. Moreover, control or salvage logging contracts should only be entered into with operators whose forestry skills are not in question. These contracts should clearly specify forest management responsibilities, including site rehabilitation. Contractors should post performance bonds that reflect the actual costs of site rehabilitation should they fail to comply with that aspect of their agreement.

Eternal Vigilance

Realizing that beetle management was going to remain an integral part of all forestry operations in the Cranbrook area, by 1980 The Cranbrook Forest District had developed a pest management component to its forest protection program. Today, this team works full-time monitoring forest sites for any sign of bark beetle infestations or for other forest pests. At the first sign of beetles invading an area, crews are dispatched to fell and treat infested trees before the beetles can develop into a sizeable population. This early detection program is a critical forest management function in the district, especially since the volume of timber in the Cranbrook Timber Supply Area considered susceptible to mountain pine beetle attack is expected to double in the next 20 to 40 years.

Be Prepared

A key to living with the beetle is anticipating what it might do next. Since the main management tool is sanitation logging of infested and susceptible stands, speed of access into these stands is essential if the beetle is to be contained in one area. Unlike the emergency road-building that went on in the Flathead, today the Cranbrook Forest District develops logging road access into pine stands deemed to be susceptible to beetle attack. The roads help facilitate quick action at the first sign of an attack.

Learn To Live With The Beetle

In addition to the work of the protection section of the Forest Service, effective pest management requires the cooperation and participation of operations personnel, inventory specialists, fisheries and habitat biologists, silvicultural planners, and just about every other arm of the organization. This integrated approach to planning must also include the forest companies operating in the areas affected. Without the full cooperation of the forest industry there is little hope of containing the spread of the mountain pine beetle.

As noted earlier, operators in the Cranbrook TSA have attempted to make beetle-killed or susceptible pine and spruce stands account for 70 percent of their

total timber harvest. Since beetle activity can flare up suddenly in different locations, the companies have had to adapt to a regime of quickly moving from one target location to another. In other words, rather than being the exception, sanitation logging to contain the spread of bark beetles in the East Kootenay is now the norm.

Staffing Up

In British Columbia in general, the fallout from the Flathead experience helped lead to the appointment of a pest management coordinator, a forest entomologist and a forest pathologist in each of the province's six forest regions. The Forest Service also established a separate pest management section at its headquarters in Victoria. Also, district offices presently are strengthening their pest detection and pest management capabilities. Too long neglected in the forest management picture, today the role of pest managers in sustaining the province's timber supply is finally receiving its due recognition.

The Human Element

A mountain pine beetle infestation can have just as great an impact on people as it does on trees. The repercussions from the Flathead infestation eventually were felt by National Park supporters, park officials, hunters, fishermen, alpine recreationists, and ulti-

"Speed of access into affected, commercial stands is essential to contain the spread of beetle outbreaks"

mately, high levels of government from two countries. It was in light of this public concern that the Cranbrook Forest District appointed its public involvement co-ordinator in 1980.

The role of a public involvement co-ordinator essentially is to address local concerns and attempt to lessen the impact of forestry activity on those most directly affected. This allows the forestry personnel to then carry out their work in an atmosphere of public acceptance.

A classic demonstration of the effectiveness of this process occurred in an area called the Peavine, which is adjacent to the watershed for the city of the Cranbrook. Here, a modest beetle infestation was discovered in the forests not far from a collection of rural dwellings. Before any action was taken, the people who were likely to be involved were fully informed of the problem and its implications. The affected area was then logged with the full understanding and cooperation of the residents.

The failure to recognize the social consequences of salvage logging is to guarantee administrative nightmares for years to come. Salvage logging can be compared to radical surgery for cancer. It precipitates a major trauma for those who have close physical and/or psychological attachments to the infested forest as they know it. Unless they can be thoroughly convinced of its long-term benefits, the concerned public will resist salvage logging out of a sense of fear and self-defence.

Cost-Benefit-Risk Analysis?

Emergency logging operations, by their very nature, can pose a definite risk to the long-term well being of the forest environment. Nonetheless it is simply assumed that the benefits from salvage logging far outweigh their disadvantages; that allowing an infestation to run its natural course is unacceptable. However, this assumption does not take into account such costs as soil degradation, the loss of recreational opportunities, or the substantial costs involved in establishing and supporting a large salvage logging operation. It would be most useful if some form of cost-benefit-risk analysis could be applied to a proposed salvage logging operation — to see if it justified the expense and effort such an operation necessarily demands.

Still To Be Learned

An interesting legacy of the Flathead beetle infestation is the fact that although neighbouring Glacier National Park and Waterton National Park experienced the same massive infestation, unlike the salvage logging effort that occurred in the Flathead, barely one stick of beetle-killed pine was removed from the two parks. Reportedly the affected areas are greening up under the grey snags, presumably with climax spruce and subalpine fir species. This situation offers pest management researchers, fire ecology researchers, and forest management researchers a unique opportunity to compare the long-term recovery of a salvage-logged forest with one left to recover naturally from a beetle infestation.

Summary

There's nothing like ten years of experience to provide perspective on an event, and today the lessons to be learned from the Flathead mountain pine beetle infestation have emerged quite clearly. Most of all, the Flathead demonstrated just how destructive mountain pine beetles can be once they invade susceptible pine stands in full force. At that point field personnel are forced to react to the situation as best they can, but they have little opportunity to influence the course of events. The forest land base and the provincial timber supply suffers as a result.

It is only logical, therefore, that pine beetle infestations of the magnitude that occured in the Flathead must — if at all possible — be prevented from developing. Consequently, preventative pest management procedures have become an integral part of forest operational planning at the provincial, regional and district level.

When bark beetle attacks do occur, they need to be detected at their earliest stages and dealt with as rapidly as possible. The outbreak must be contained and prevented from gaining momentum. For this to happen, district field personnel need to be as experienced in detection and sanitation logging as they are in fire fighting. Moreover, they need to operate in close cooperation with resource officers from other jurisdictions to maintain a cohesive pest management policy for the district. In many instances the understanding and support of the general public is required to ensure that pest management procedures are carried out swiftly and efficiently.

These are the basic principles of pest management in British Columbia today, and they evolved largely from the hands-on experiences gained in the Flathead. Rather than having to react to a major crisis, today's pest managers attempt to intervene in a situation before it can develop crisis proportions. They know full well that if they don't keep their guard up, a beetle infestation equally as devastating as the one that overran the Flathead could strike the province at almost any time.

EPILOGUE

The mountain pine beetle infestation in the Flathead Valley, 1976 to 1981 was extensive and devastating. Co-operation between various government agencies, industry, and private citizens was required to deal with the complex problem presented by this large insect outbreak in a remote and somewhat controversial area. The result of this effort over several years was the salvaging of most of the commercially valuable affected timber while causing minimal long term impact on other resources. Innovations such as the Co-ordinated Access Management Process (CAMP) were developed to meet the situation and have since been employed in other areas of the Province.

The efforts directed at the Flathead mountain pine beetle outbreak were primarily for the salvage of killed timber before commercial value was lost. Later in the operations, emphasis shifted, somewhat, to extraction of newly infested timber in an attempt to reduce the spread of the outbreak. This latter approach reflects a greater commitment or understanding of pest management principles to reduce damage.

The late 1970's and early 1980's saw mountain pine beetle emerging as a major forest management problem throughout the Province. Outbreaks were occurring in all regions with some, such as the Chilcotin outbreak to the west of William's Lake, far exceeding the Flathead infestation in size and amounts of timber being killed. The vast areas of mature pine throughout the interior of the Province were at risk of being destroyed; experience gained from the Flathead showed the potential for damage should infestations be left unchecked. The Flathead experience also showed the need for a co-ordinated and co-operative effort when dealing with mountain pine beetle.

By 1984, mountain pine beetle infestations had expanded to over 500 000 hectares in the Province. The decision was made by government to implement an aggressive program to manage this insect, protecting the large areas of pine at risk, and reducing losses in areas where infestations were active. The intent of the program was to reduce the rate of spread of beetle infestations and buy time in which to implement more comprehensive management of lodgepole pine forests. The program was co-ordinated between affected regions, and government and industry co-operated closely in establishing harvesting and other treatment priorities based on the existing beetle situation and potentials for further expansion and damage.

Rather than concentrating on salvaging beetle-killed timber, current efforts are directed at the beetle itself and at removing susceptible stands before they become infested. Small patches of beetle infested trees are felled and burned or harvested before they can expand; road access has been built into high risk areas so that vulnerable stands in these areas can be removed or so that small outbreaks can be dealt with quickly. And, intensive ground and aerial surveys are carried out annually to find and prioritize new infestation spots. New technology is employed, including the use of aerial photography for detection, and attractants which limit the spread of beetles, thereby facilitating successful treatments.

This direct approach to reducing losses caused by mountain pine beetle has shown success when applied in a consistent and thorough manner with adequate follow-up. The most effective application of those techniques has been in cases where the insect is just beginning to expand. Future management practices should prevent widespread beetle outbreaks and damage as occurred in the Flathead. Planning timber harvesting so that stands are removed before being infested and vigilence to detect and treat new, small infested spots will help to avoid unacceptable losses.

The Flathead experience and others have shown what the potential of mountain pine beetle can be and what co-ordinated planning can do to prevent castastrophe. The lessons learned, if remembered and applied properly by government agencies, industry, and private interest groups will lead to more effective management of lodgepole pine. As with the management of other valuable tree species, the consideration of pest management principles will assist in maintaining and enhancing the forest resource.

Mountain pine beetle is only one of many forest insect and disease pests which have impact on forest management. Entomology and pathotology specialists must be retained in management agencies to provide input into planning; support staff trained in pest management at field offices are needed to ensure that potential problems are dealt with effectively before they become crisis situations.